MONTANA STATE UNIVERSITY

Mountains & Minds

Physics Department Newsletter
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PHYSICS NEWSLETTER
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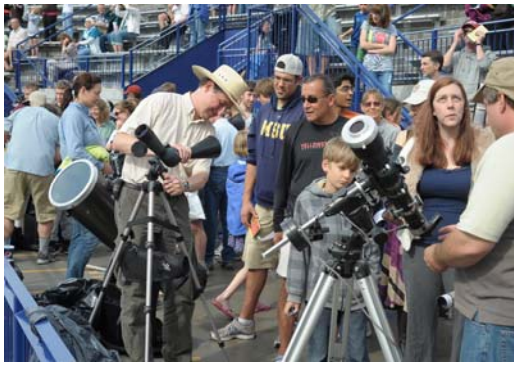
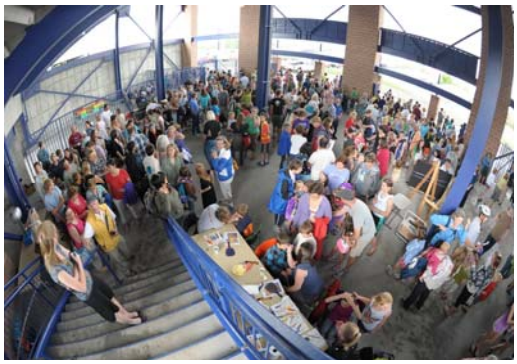
Journey of a Lifetime

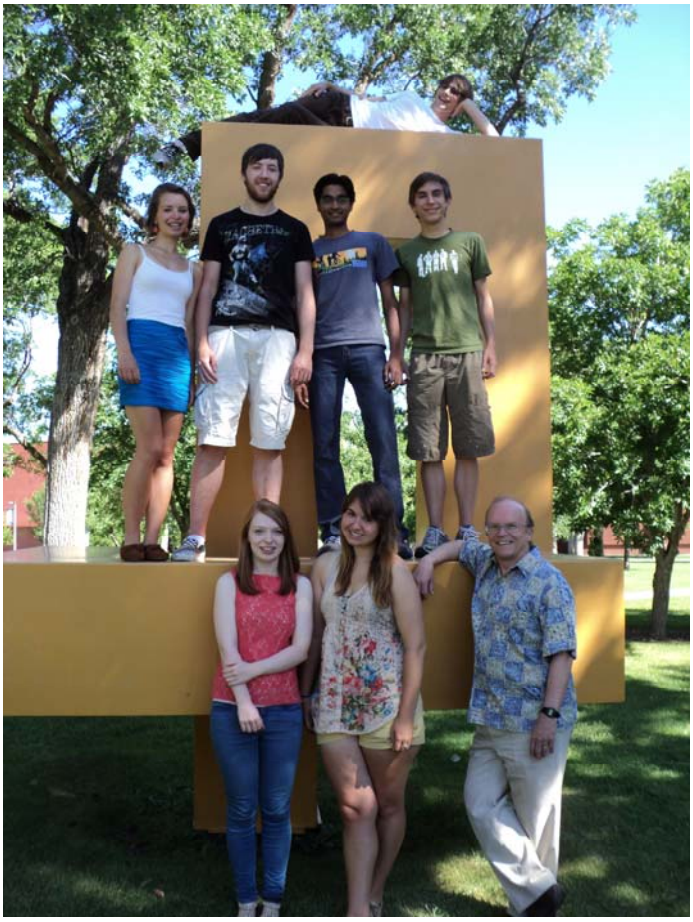
On Tuesday, June 5, the Montana Space Grant Consortium hosted a **Transit of Venus** viewing event at the Montana State University (MSU) football stadium that attracted 2,000 visitors of all ages. The celebration offered educational booths, activities for children, and a chance for curious stargazers to take a look directly at the sun through solar viewing glasses handed out at the gate or through telescopes with filters set up by the local astronomy club. The transit was also shown live on the big screen of the stadium scoreboard. Even though rain, lightning, and even a little hail threatened the event shortly after MSU President Waded Cruzado gave her opening remarks, patient viewers got their chance to see Venus as it passed across the Sun for the last time in over 100 years. (Photos courtesy of Joe Shaw.)





During the summer we welcomed Professor HEric PriestH from St. Andrews University, Scotland, as a visiting professor. Eric is a theoretical solar physicist with expertise on modeling the subtle nonlinear interaction between the plasma atmosphere of the Sun and its magnetic field, which is responsible for much of the dynamic behavior we see. Prof. Priest has been visiting MSU every summer for the last seven or eight years. During his visits he has played a very active role in our solar REU program by mentoring students and by teaching a brief course in MagnetoHydroDynamics, perfectly adapted for the level of the REU students. Prof. Priest has also collaborated in research projects with several of our faculty resulting in joint papers. In recognition of this valuable, ongoing collaboration we were happy to appoint Eric as an Affiliate Professor of Physics in our department.

Solar Physics REU – Summer 2012



Participants in this year's REU program in Solar Physics included nine undergraduate students. The program was organized by co-PIs David McKenzie and Jiong Qiu. The students are listed here with their research project title and faculty mentor give in parentheses:

- Martin Donachie, University of Glasgow, "Probing Magnetic Reconnection with Active Region Transient Brightenings" (Adam Kobelski & Roger Scott)

- Heidi Dritschel, University of St Andrews, "Evaporation Driven by Thermal Conduction" (Dana Longcope & Sean Brannon)

- Joseph Jensen, Utah State University, "Computing the Magnetic Energy of the Sun's Magnetic Field" (Dana Longcope) – not shown.

- Sushant Mahajan, Institute of Technology, BHU (ITBHU), India, (Piet Martens)

- Sierra OBryan, Thomas More College, "Study of Sheet Structures in Eruptive Solar Flares" (David McKenzie)

- Michael Pinkard, Lafayette College, "Space Hardware Development: Space Flight Systems for Space Science " (David Klumpar)

- Paul Schale, Seattle Pacific University, "Inferring Magnetic Reconnection from UV Signatures in Flares" (Jiong Qiu)

- Zoe Sturrock, University of St Andrews, "Inferring Magnetic Reconnection from UV Signatures in Flares" (Jiong Qiu)

New Faces in the Department

Chris Harmon
MSGC
Program Coordinator

Antoine Klein
Postdoc
Gravity Group

Kento Yagi
Postdoc
Gravity Group

Alwyn Rebello
Postdoc
Neumeier Group

(Not Shown)

Mark Wolfenden
Postdoc
ICAL

GENERAL NEWS

6th Solar Information Processing Workshop: The department welcomed several participants and companions for the 6th Solar Information Processing Workshop, August 13 - 16, 2012. The workshop addressed generally how information about the Sun can be derived, stored, shared, transformed and analyzed using appropriate techniques from many other disciplines, including image processing and computer vision techniques applied to solar physics, as well as other topics such as machine learning, data mining and new computing strategies. The local organizing committee was chaired by Piet Martens who also received two grants from NASA and NSF to support the workshop.

Research Expenditures for FY12: The Physics Department was once again one of the campus leaders in total research expenditures for FY12, with expenditures of $7,014,944. Total sponsored research expenditures for MSU were $112.3M for the year. In the department, the various research groups attract approximately 70 grants each year.

2012-2013 MSGC Fellowships, Scholarships, and Hiscock Memorial Award: Congratulations go to Physics graduate students Michael Freed, Sara Lowder and Kathryn Williamson, on their award of MSGC Fellowships for 2012-2013. Selections for the 2012-2013 Montana Space Grant Fellowship and Scholarship Program reflect each student's past achievements, as well as present and future commitments to academic excellence. For a complete list of awardees see http://spacegrant.montana.edu/scholars2012-2013.htm. MSGC also announced that the recipient of the 2012 Hiscock Memorial Award is Bob Warwood, a senior in MSU physics (Teaching Option). He won for his proposal of a viral Public Service Announcement (PSA) series titled “Keep the Dream Alive”, which will highlight the importance of the fields of Science, Technology, Engineering, and Mathematics, with emphasis on the importance of space science and exploration.

A big thank goes out to all of you who provided contributions to support the Hiscock Memorial Award, especially those who made substantial contributions this year to get us to the endowment level.

TRAVEL

AAS/SPD meeting in Anchorage AK, June 12-16, 2012: A large contingent (23) of faculty and students from the department traveled to Anchorage, AK, for the annual meeting of the Solar Physics Division of the American Astronomical Society. Among other activities, Piet Martens organized a session on “Solar Information Processing and Distribution in the Peta-byte Era”. Piet was also a panel member in the first AAS press conference at the meeting, “What’s New under the Sun?” See below a list of talks and posters presented at the meeting. Attendees included:

Ernest Amouzou Shane Atwood Sean Brannon Hans Courrier Alec Engell Sarah Jaeggli
Charles Kankelborg Adam Kobelski Ying Li Wenjuan Liu Dana Longcope Chris Lowder
Anna Malanushenko Piet Martens David McKenzie Dibyendu Nandi Jacob Plovanic Joe Plowman
Jiong Qiu Roger Scott Lucas Tarr Kathryn Williamson Keiji Yoshimura

MSU-Bozeman and the MSU Solar Physics Group were also selected to host the 2013 meeting of the Solar Physics Division of the American Astronomical Society. The meeting will take place July 8-11, and we expect approximately 300 attendees. This is the second time MSU has hosted the SPD meeting; the previous time was 1997. Local organizers for MSU are: David McKenzie, Dana Longcope, and Toni Lee of MSU's Conference Services. Congratulations, and good luck with the conference!

David McKenzie participated in the Solar Dynamics Observatory Education & Public Outreach Team Workshop, in Boulder, CO, May 13-16.

David McKenzie attended the 2012 Solar, Heliospheric, and Interplanetary Environment (SHINE) workshop, in Wailea Maui, HI, June 25-30

David McKenzie, Adam Kobelski, Roger Scott, Lucas Tarr, and Chris Lowder attended the 6th Hinode Science Meeting at the University of St. Andrews, St. Andrews, Scotland, August 13-17, 2012.

Dr. Sebastien Ermeneux, ALPhANOV, Centre Technologique Optique et Lasers, Bordeaux, France, visited Rufus Cone on July, 26, 2012. Ermeneux did part of his Ph.D. thesis (Laboratoire de Physico-Chimie des Matériaux Luminescents, Université Claude Bernard Lyon I, Lyon, France) in the Cone lab.

Rufus Cone visited Philippe Goldner and Alban Ferrier at the Laboratoire de Chimie de la Matière Condensée de Paris, CNRS, Ecole Nationale Supérieure de Chimie de Paris - Chimie Paristech in Paris, France, in August 2012. The two groups are collaborating on rare earth doped transparent ceramic optical materials.

Rufus Cone was on the International Committee for the Conference on Holeburning, Single Molecule, and Related Spectroscopies: Science and Applications, University of Tübingen, Germany, August 27-30, 2012.

Rufus Cone attended, chaired a session, and gave an invited talk, at the 11th International Conference on Hole Burning, Single Molecule and Related Spectroscopies: Science and Applications" in Tubingen, Germany, August 26 – 30, 2012. For MSU old-timers, this conference was organized by the institute once headed by Wolfgang Göpel, who left MSU to take up that position.

PHYSICS ALUMNI NEWS

MSU PhD graduate Dr. Sabrina Savage (Solar Physics, 2010) accepted a Civil Service position with NASA, and transferred to NASA's Marshall Space Flight Center, in Huntsville, Alabama. Dr. Savage was appointed the Deputy Project Scientist for the Hinode mission, working with MSU graduate Dr. Jonathan Cirtain, who is the Hinode Project Scientist.

The 2012 Karen Harvey Prize was won by Piet Marten's former postdoc and close collaborator, Dibyendu Nandi, "for a significant contribution to the study of the Sun early in a person's professional career". Nandi delivered his prize lecture at the AAS/SPD meeting in Anchorage Alaska, June 2012. For more information see: *http://www.montana.edu/cpa/news/nwview.php?article=10736*

Jared Rice was hired by Miami University in Oxford, OH to teach calculus-based physics (mechanics, waves, and quantum mechanics) for non-physics undergraduates for the fall. He says that his one-semester contract was recently extended to have him teach the second half of the course (thermodynamics, E&M, and special relativity) in the spring. He adds that his "teaching experience at MSU was a large factor in getting the job at Miami U. I enjoyed my time teaching at MSU and wouldn't exchange that for anything." Congratulations, Jared. We have an address for Jared in the front office.

PUBLICATIONS

"Temperature dependence of electron magnetic resonance spectra of iron oxide nanoparticles mineralized in Listeria innocua protein cages", R. J. Usselman, S. E. Russek, M. T. Klem, M. A. Allen, T. Douglas, M. Young, Y. U. Idzerda, and D. J. Singel, J. of Appl. Phys. 112 (2012).

"Electrochemically driven cation segregation in the mixed conductor $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$", M. Finsterbusch, A. Lussier, J.A. Schaefer, Y.U. Idzerda, Solid State Ionics 212, 77 (2012).

"Epitaxial growth and thermoelectric properties of TiNiSn and $Zr_{0.5}Hf_{0.5}NiSn$ thin films", T. Jaeger, C. Mix, M. Schwall, X. Kozina, J. Barth, B. Balke, M. Finsterbusch, Y. U. Idzerda, C. Felser, G. Jakob, Thin Solid Films 520, 1010 (2012).

"Low-altitude Reconnection Inflow-Outflow Observations during a 2010 November 3 Solar Eruption", Savage, S.L., Holman, G., Reeves, K.K., Seaton, D.B., McKenzie, D.E., and Su, Y. 2012, Astrophysical Journal, 754, 13.

"A Multi-Wavelength Statistical Study of Supra-Arcade Downflows", Savage, S.L., and McKenzie, D.E. 2012, ASP Conference Series, Vol 455, Proceedings of a conference held 11-15 October 2010 in Palermo, Italy. Edited by Luis R. Bellot Rubio, Fabio Reale, and Mats Carlsson. San Francisco: Astronomical Society of the Pacific, 2012, p.305.

"Experimental Flat-Field for Correction of XRT Contamination Spots", McKenzie, D.E., Fox, J.L., and Kankelborg, C., in Hinode-3: The 3rd Hinode Science Meeting, Proceedings of the conference held 1-4 December 2009 at Hitotsubashi Memorial Hall, Tokyo, Japan. Edited by T. Sekii, T. Watanabe, and T. Sakurai. ASP Conference Series, Vol. 454. San Franciso: Astronomical Society of the Pacific, 2012., p.453

"Inferring Nonthermal Particle Characteristics from Thermal Emission Signatures", Kobelski, A.R., McKenzie, D.E., and Winter, H.D., in Hinode-3: The 3rd Hinode Science Meeting, Proceedings of the conference held 1-4 December 2009 at Hitotsubashi Memorial Hall, Tokyo, Japan. Edited by T. Sekii, T. Watanabe, and T. Sakurai. ASP Conference Series, Vol. 454. San Franciso: Astronomical Society of the Pacific, 2012., p.333

"Shrinking Loops Observations for the 2008 April 9 Flare", Savage, S.L., McKenzie, D.E., Reeves, K.K., and Forbes, T.G., in Hinode-3: The 3rd Hinode Science Meeting, Proceedings of the conference held 1-4 December 2009 at Hitotsubashi Memorial Hall, Tokyo, Japan. Edited by T. Sekii, T. Watanabe, and T. Sakurai. ASP Conference Series, Vol. 454. San Franciso: Astronomical Society of the Pacific, 2012., p.295

“Temperature-dependent structures of proton-conducting $Ba(Zr_{0.8-x}Ce_xY_{0.2})O_{2.9}$ ceramics by Raman scattering and x-ray diffraction”, C.-S. Tu, R.R. Chien, V.H. Schmidt, S.C. Lee, and C.-C. Huang, *J.* Phys.: Condens. Matter **24**, 155403 (6 pp.) 2012.

“Robert Blinc obituary”, by Zvonko Trontelj, Hugo Schmidt, and David C. Ailion, Physics Today **65**, p. 70, April 2012. Robert was a leading ferroelectrics and liquid crystal expert, and visited MSU several times.

“Slowly Rotating Black Holes in Dynamical Chern-Simons Gravity: Deformation Quadratic in the Spin”, Kent Yagi, Nicolas Yunes, Takahiro Tanaka, arXiv:1206.6130 [gr-qc], Phys.Rev. D86 (2012) 044037.

“Resonant Post-Newtonian Eccentricity Excitation in Hierarchical Three-body Systems”, Smadar Naoz, Bence Kocsis, Abraham Loeb, Nicolas Yunes, arXiv:1206.4316 [astro-ph.SR]. Accepted to Ap. J.

“Model-Independent Test of General Relativity: An Extended post-Einsteinian Framework with Complete Polarization Content”, K. Chatziioannou, N. Yunes, N. Cornish, arXiv:1204.2585 [gr-qc], Phys.Rev. D86 (2012) 022004.

“Circumbinary MHD Accretion into Inspiraling Binary Black Holes”, S. C. Noble, B. C. Mundim, H. Nakano, J. H. Krolik, M. Campanelli, Y. Zlochower, N. Yunes, arXiv:1204.1073 [astro-ph.HE], Astrophys.J. 755 (2012) 51.

PROPOSALS SUBMITTED

"Measurement of Plasma Conditions and Dynamics in Flare Current Sheets", submitted to NASA by David E. McKenzie, 11/1/2012-10/31/2015: $392k

"MSU Contribution to Hinode/XRT Phase E: Mission Operations & Data Analysis--Extended Mission", submitted to SAO by David E. McKenzie, 11/1/2012-10/31/2014: $375k

PROPOSALS FUNDED

"Science Support and Education and Public Outreach Effort in support of the AIA Investigation on the SDO Mission", extended for 12 months to April 30, 2015, $156k addition to the contract.

“High Resolution Thermal Expansion Measurements of Ice”, NSF, 6/1/12 to 5/31/15, $210,000, John J. Neumeier.

“Laser Frequency References Based on Rare Earth Spectral Hole Burning,” July 30, 2012 – September 10, 2013, DARPA STTR with Physical Sciences Inc, Boston, MA, with Rufus Cone.

"Enabling Quantum Memory for Light," NSF Division of Physics- AMO/QIS Program, August 15, 2012 – July 31, 2013, Rufus Cone. This project involves working closely with Wolfgang Tittel of the University of Calgary.

INVITED TALKS

“Transition Metal Valence Mapping on SOFC Cathodes", H. Bhatkar, E. Arenholz, and Y. U. Idzerda, 13th Annual SECA Workshop, Pittsburgh, PA, July 24-25 (2012).

"Controlling spin damping with magnetostrictive films", Y. U. Idzerda, Nat. Inst. of Standards and Technology, Gaithersburg, MD, May 27 (2012).

"Transit of Venus: A Unique Opportunity for Science", at the 2012 meeting of the American Medical Fly Fishing Association, in West Yellowstone, MT, by David McKenzie

"Image Recognition and Feature Detection in Solar Physics", Petrus C. Martens, Special Session on "Solar Information Processing and Distribution in the Petabyte Era", AAS/SPD Meeting, Anchorage, AK, June 11-14, 2012.

"Compressing SDO's FITS image files, a study from an image-processing perspective", J. Banda, R.A. Angryk, and P.C. Martens, SIP VI workshop, Bozeman, MT, August 2012.

"Dynamic Fluid Flows in Supra-Arcade Current Sheets/Thermal Halos", by David McKenzie, at the SHINE Workshop, June 27.

“Rare-Earth Doped Materials for Quantum Information, Optical Signal Processing, Laser Frequency Stabilization, Ultra-sharp Filters, and Medical Imaging Technology”, R. L. Cone, C. W. Thiel, Yongchen Sun, Thomas Böttger, and R. M. Macfarlane, Holeburning, Single Molecule, and Related Spectroscopies: Science and Applications, University of Tübingen, Germany, August 27-31, 2012.

CONTRIBUTED TALKS

"Temperature and Density Analysis of a Coronal Loop Observed by EIS And AIA", J. Plowman, P. Martens, C. Kankelborg, M. Ritchie, J. Scott, R. Sharma, AAS/SPD, Anchorage, AK, June 12-16, 2012.

"Filament and Sigmoid Statistics Gathered by Newly Developed Automated Feature Finding Modules", P. Martens, SIP VI workshop, Bozeman, MT, August 2012.

"Fuel cell and electrolysis mode results for BCY SOFC compared with model predictions" by V.H. Schmidt and C.-L. Tsai, 221st Electrochemical Society Meeting, Seattle, WA, May 6-10, 2012.

"Fuel cells" by Hugo Schmidt, Montana Renewable Energy Fair, Butte, MT, July 21, 2012.

"Rare-earth-doped Transparent Ceramics for Quantum Memory and Optical Signal Processing Applications," Charles W. Thiel, Yongchen Sun, Philippe Goldner, Alban Ferrier, Akio Ikesue, Roger M. Macfarlane, and Rufus L. Cone, Optical Technology, Conference, Bozeman, Montana, August 17, 2012.

POSTER PRESENTATIONS

"A Comparative Evaluation of Automated Solar Filament Detection", Michael Schuh, J. Banda, P. Bernasconi, R. Angryk, P. Martens, AAS/SPD Meeting, Anchorage, AK, June 12-16, 2012.

"Content-based Image Retrieval for Solar Physics: First Steps And A Practical Demonstration", Juan Banda, R. Angryk, P. Martens, AAS/SPD Meeting, Anchorage, AK, June 12-16, 2012.

"Supporting Solar Physics Research via Data Mining", Rafal Angryk, J. Banda, M. Schuh, K. Ganesan Pillai, H. Tosun, P. Martens, AAS/SPD Meeting, Anchorage, AK, June 12-16, 2012.

"The Virtual Solar Observatory: What Are We Up To Now?", J. B. Gurman, F. Hill, F. Suˆrez-Solˆ, R. Bogart, A. Amezcua, P. Martens, J. HourclŽ, K. Hughitt, AAS/SPD, Anchorage, AK, June 12-16, 2012.

"Use of a Time Delay Dynamo Model to Obtain Sun-Like Sunspot Cycles", Ernest C. Amouzou, D. Nandi, A. Munoz-Jaramillo, P. C. H. Martens, AAS/SPD Meeting, Anchorage, AK, June 12-16, 2012.

"Compressing SDO's FITS image files, a study from an image-processing perspective", J. Banda, R.A. Angryk, and P.C. Martens, SIP VI workshop, Bozeman, MT, August 2012.

"Polarity Inversion Line Module", A. Engell, P.C. Martens, and R. Timmons, SIP VI workshop, Bozeman, MT, August 2012.

"Evaluating Automated Solar Event Detection", M. Schuh, J. Banda, R. Angryk, and P. Martens, SIP VI workshop, Bozeman, MT, August 2012.

"Re-interpretation Of Supra-arcade Downflows In Solar Flares", Savage, Sabrina, McKenzie, D. E., & Reeves, K. K., American Astronomical Society, AAS Meeting #220

"Flare Half-Loops: What Are They?", McKenzie, David Eugene, Guidoni, S. E., Longcope, D. W., & Yoshimura, K., American Astronomical Society, AAS Meeting #220

"Multi-Stranded Coronal Loops - A Statistical Forward Model", Kobelski, Adam, & McKenzie, D. E. American Astronomical Society, AAS Meeting #220

"Complex Dynamic Flows in Solar Flare Sheet Structures", McKenzie, David Eugene, Reeves, K. K., & Savage, S. L., American Astronomical Society, AAS Meeting #220

"Nozzle Driven Shocks in Post-CME Plasma", Scott, Roger B., Longcope, D. W., & McKenzie, D. E. American Astronomical Society, AAS Meeting #220

"Thermal Structure of Supra-Arcade Plasma in Two Solar Flares", Reeves, Kathy, Savage, S. L., McKenzie, D. E., & Weber, M. A., American Astronomical Society, AAS Meeting #220

"Calibration of Hinode/XRT for Coalignment", Yoshimura, Keiji, & McKenzie, D. E., American Astronomical Society, AAS Meeting #220

"Photometric Uncertainties within Hinode XRT", Kobelski, Adam, Saar, S. H., Weber, M. A., McKenzie, D. E., & Reeves, K. K., American Astronomical Society, AAS Meeting #220

"Measured conditions and dynamics in flare current sheets", David E. McKenzie, Sixth Hinode Science Meeting, St. Andrews, Scotland, August 13-17, 2012.

"Thermal Structure of Supra-Arcade Plasma in Solar Flares", K.K. Reeves, M.A. Weber, S.L. Savage, J. Raymond, & D.E. McKenzie, Sixth Hinode Science Meeting, St. Andrews, Scotland, August 13-17, 2012.

"Peristaltic Shocks in Post-CME Unreconnected Field", Roger B. Scott, Dana W. Longcope, David E. McKenzie, Sixth Hinode Science Meeting, St. Andrews, Scotland, August 13-17, 2012.

"Multi-Instrument observations of flux emergence leading to a flare", Lucas Tarr & Dana Longcope Sixth Hinode Science Meeting, St. Andrews, Scotland, August 13-17, 2012.

"Photometric Uncertainties within XRT", A.R. Kobelski, S.H. Saar, D.E. McKenzie, M.A. Weber, K.K. Reeves, & E.E. DeLuca, Sixth Hinode Science Meeting, St. Andrews, Scotland, August 13-17, 2012.

"Full Surface Coronal Hole Observations to Measure and Constrain Open Magnetic Flux", C. Lowder, J. Qiu, & R. Leamon, Sixth Hinode Science Meeting, St. Andrews, Scotland, August 13-17, 2012.

"Multi Stranded Coronal Loops in Active Region Transient Brightenings", Adam R. Kobelski, David E. McKenzie, & Martin Donachie, Sixth Hinode Science Meeting, St. Andrews, Scotland, August 13-17, 2012.

"Calculating Separate Magnetic Free Energy Estimates for Active Regions Producing Multiple Flares: NOAA AR 11158", Lucas Tarr & Dana Longcope, Sixth Hinode Science Meeting, St. Andrews, Scotland, August 13-17, 2012.